A320-X

BASIC TUTORIAL FLIGHT

AUA303: LOWW - EKCH

Revision Date: 24JUN18

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The purpose of this first tutorial is to give you a basic document with which to fly the A320 using real procedures on a flight from Vienna Schwechat (LOWW) to Copenhagen Kastrup (EKCH). This tutorial is designed to be flown with “best use of equipment”, meaning all phases of the flight will use the autopilot and all systems will be in normal operation mode. There will be no information regarding manual flight procedures, real operational specifics or discussion of proper airmanship and general ATPL knowledge.

After you have completed this flight, you’ll be able to handle the A320 with all its systems on normal operations with the same workflows used on the real aircraft checked using the very same flight checklists. During cockpit preparation, some less critical flow items – i.e. checking systems which are already in good working order for the flight - will be skipped so as to not confuse you with too many details for this first flight.

To cover as many systems as possible and to keep things easy at the same time for your first flight, a standard instrument departure (SID) using the autopilot will be flown, as well as a full autoland on an ILS approach requiring no manual inputs on the controls until you vacate the runway.

USEFUL ADD-ON SOFTWARE

Below are listed some recommendations for additional software to enrich your simulation experience. However, none of these are required to complete the tutorial flight. They are merely recommendations for more realism.

Available scenery add-ons for P3D

You might want to consider the following two airport scenery products which are available for purchase:

Vienna Schwechat - LOWW
FlyTampa-Vienna by FlyTampa - www.flytampa.org

Copenhagen Kastrup - EKCH
FlyTampa-Copenhagen by FlyTampa - www.flytampa.org

Charts

There would be no aviation without charts. Yet many users of Prepar3D fly without them.
You should have the appropriate charts with you on every flight.

- Jeppesen
  These charts are made by Jeppesen, part of Boeing, and are the same ones used by airlines around the world.
  They are available for purchase from Navigraph:
  www.navigraph.com

- ONLINE AIP
  Many countries worldwide regard their aeronautical information as public data and make it freely available in an online AIP.
  AIP Austria: http://eaip.austrocontrol.at
  AIP Denmark: http://aim.naviair.dk

Pushback Tool

Pushing back from a nose-in stand (also called gate) is done frequently when flying passenger aircraft such as the A320. Pushing back will be required for this tutorial flight. While P3D includes a crude way of doing this, the problem with that method is that you will need to pay a lot of attention to the pushback rather than aircraft startup. The more realistic way would be for the ground crew to perform the pushback autonomously while the pilots work their start-up procedures.

To enable a more realistic pushback procedure, there is a tool available for purchase:

Ground Services X - GSX
By FSDreamteam - www.fsdreamteam.com

Simulates ground services such as pushback, follow-me cars, marshallers and much more. Works with all airport sceneries (default and add-on).

FLIGHT PREPARATION

Setting up P3D and the FSL A320

Start Prepar3D and on the opening screen select the following items before loading the simulator:

1. VEHICLE: **Piper Cub**
2. LOCATION: **LOWW** (Vienna), **Gate G46** (or Gate D22 when using FlyTampa scenery)
3. WEATHER: **Fair Weather** theme
4. TIME AND SEASON: Any date, time of day **14:35h LT**

Press 'OK' to load the simulation.

5. **Shut down** the Piper's **engine**, you may use the keystroke CTRL-SHIFT + F1.
6. Go to the P3D vehicle selection menu and choose the **FSLabs A320X** equipped with **CFM** engines.

The A320 is now placed at gate D22, or in case of the default P3D scenery somewhere near that gate (since the default scenery, unfortunately, is incomplete and outdated).

Note: You may save the flight at this point, in case you do the tutorial flight a second time.

Be aware that this method of loading the aircraft is only used to get a cold & dark aircraft in a very simple way. Once familiar with using the MCDU, you may load the A320-X directly from the scenario setup screen and choose its panel state using the MCDU. See the Introduction Guide for further information.

Weather

There's no significant weather to consider for this flight other than some light winds, so the weather briefing is a quick one:

Vienna Schwechat:
Temperature: 14° C
Surface Wind: calm
Clouds: CAVOK

Copenhagen Kastrup:
Temperature: 15° C
Surface Wind: calm
Clouds: CAVOK

Average wind at CRZ level: 270° / 25kts
QNH: 1013hPa at both airports

Information for Beginners

You'll see boxes like this one throughout this tutorial. These boxes provide basic information about airliner flying, various systems and the consequences of your actions.
These are aimed at those of you not yet familiar with glass cockpit airliners in general.
If you have flown other airliners of this type - real or on a PC based simulator - you may simply skip these boxes as they are not required for the work flow of this tutorial.

AIRCRAFT PREPARATION

As you can see, the aircraft is sitting at the gate, completely powerless. This can happen after an overnight stay at the airport. Usually the aircraft is then powered up long before the pilots arrive. Maintenance personnel will make sure that the aircraft is powered and ready for when the flight crew arrives. Maintenance, cleaning or refuelling may also start long before the pilots enter the aircraft.

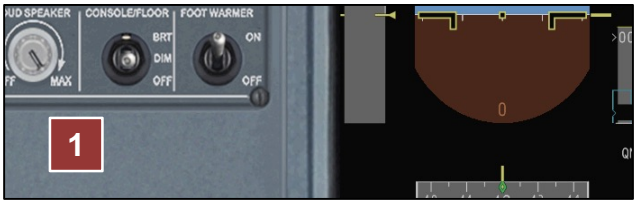
Note: If the aircraft is not completely powerless at this point, it means that you have already selected a default panel state. You must now load the correct "cold and dark" panel state according to the introduction manual, chapter 2.

With this in mind, it's time to do the mechanic's job and get some power to the aircraft to allow it being prepared for flight.
First we need someone outside the aircraft to connect the power cable and put the wheel chocks in place. This can be accomplished by using the MCDU option pages.

To insert data, execute functions or switch to pages, the MCDU features keys left and right of each field. These line select keys (LSK) are referred to according to their vertical position vertical and whether they are left or right of the display. For example, the key on the top left is LSK 1L, the one on the bottom right is LSK 6R.

Note: This tutorial includes instructions for 2D-Panel navigation. If you are flying this in Virtual Cockpit mode, just move your head accordingly and disregard all panel-switching instructions.

- For this tutorial, we shall be using the left MCDU. To open it, left-click into the grey area below the loudspeaker knob to the left of the Primary Flight Display (**1**). Note: Clicking this area with a right click would open the right MCDU.



- To turn on the MCDU, press and hold the 'BRT'-key (**2**) until you see text being displayed. Then press the LSK 5R (**3**) to access the option pages.

- In the option pages access the 'EXT CTRLS' sub-menu (**4**) by pressing the LSK 6L.

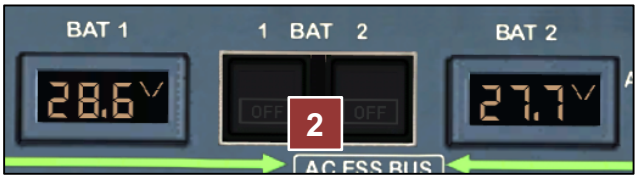
- Put the Ground Chocks in place by selecting the LSK 6L (**5**), then connect the GPU (GPU stands for "ground power unit") using the LSK 3L (**6**)

The aircraft is now ready to be powered up.

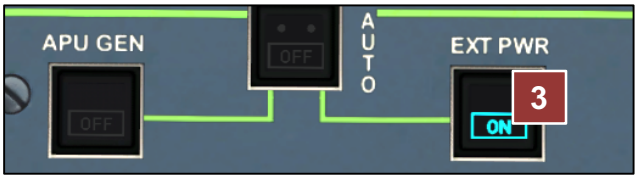
Powering up the Aircraft

Start at the overhead panel by left-clicking the cockpit window centre post (**1**).

On the ELEC panel look for the 2 battery switches (**2**). Press both so that the white 'OFF'-lights are extinguished.



Move down to 'EXT PWR'-switch showing a green 'AVAIL'-light. Press the switch to turn on AC-power. The 'ON'-light will illuminate to indicate the external cable providing power (**3**).



Then move further down to the lights panel labelled 'EXT LT'. Look for the 'NAV & LOGO'-switch and right-click it once to move it to the '1'-position to turn on the navigation lights (**4**). This is done to indicate to all outside ground personnel that power is turned on.

The flight deck is now in the state in which pilots usually find it when boarding the aircraft.

COCKPIT PREPARATION

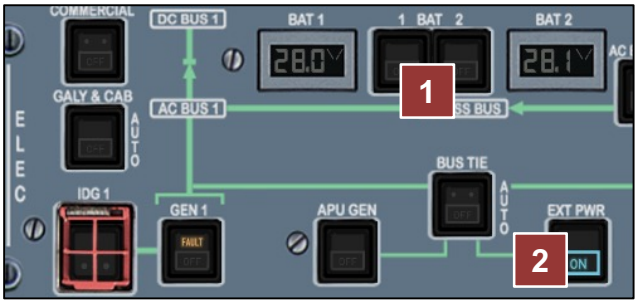
You now find yourself on the flight deck, the time of day being late afternoon.
Take your seat and have a look at your flight documents which provide the following details:

- Route
  LOWW to EKCH via:
  LANUX L858 **HDO** M725 **GERGA** T239 **PEROM** T298 **MONAK**
- Departing runway and SID
  Runway 11, SID LANUX1A
- STAR, Approach and landing runway
  MONAK1M, CAT1 ILS approach RWY 04L
- Loadsheet
  Zero Fuel Weight: 61'000kg
  ZFW CG: 28.8%
- Fuel
  5.87 metric tonnes
- Flight Duration
  80 minutes flying time
- Performance
  Cruise Level: 360
  Cost Index: 20

With this in mind, have a look at all the panels to determine what state the aircraft is in.

Once again open the overhead panel by left-clicking the cockpit window centre post.

Looking at the electrics panel on the overhead (labelled ELEC) you can see that we already have battery power on (as no OFF light is illuminated - **1**) and external power (EXT PWR) is connected and activated. (**2**)



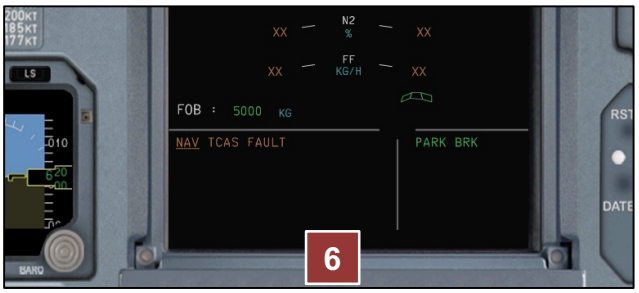
Going all the way down to the lighting and APU panel, you'll notice that the NAV lights (**3**) are turned on. The APU is still off (**4**).

Looking at the top left of the overhead panel, you can see all three inertial reference systems (ADIRS) are off (**5**).

To close the overhead panel, left-click the X-symbol at the top left of the overhead panel.

While the switches and lights on the overhead panel show the state of many of the various systems of the A320, you will have a much more detailed overview of the systems using the lower ECAM display or system/status display (SD) which is controlled by the ECAM control panel located on the centre pedestal below the lower ECAM display. Using the pushbuttons of the ECAM control panel, you may cycle through the various system pages giving you an even better initial overview.

To access the lower ECAM display and its controls on the 2D panel, left-click on the frame below the upper ECAM display (**6**).



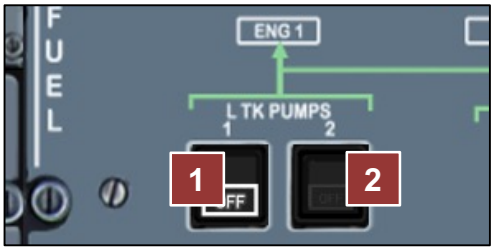
The ECAM control panel (**7**) will pop up on the bottom right side of the screen, allowing you to cycle through the system pages on the SD.

Continuing Cockpit Preparation (Overhead Panel)

The first step in preparing the cockpit is to **extinguish all the white lights on the overhead panel** by pushing each corresponding button. Start scanning for these at the lower left of the overhead panel then move upwards, then lower centre, and then the lower right side. Note that by doing so, you will not necessarily be turning on the corresponding system or component but setting it into auto or armed mode (if available).

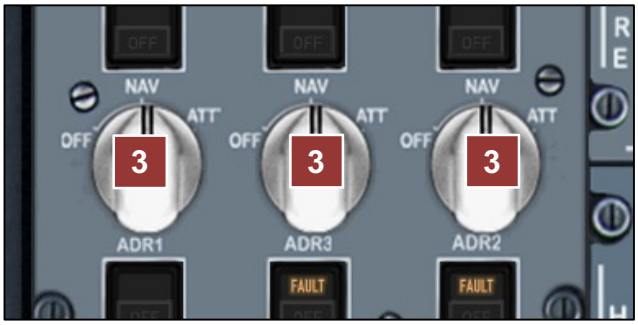
Make sure to scan the entire overhead panel for black square pushbuttons with a white light on them (**1**), then press that button to extinguish it (**2**).

Note: For guarded switches use the right mouse button first to lift the guard then the left button to push.



- ADIRS
  Rotate all three ADIRS selectors (**3**) from OFF to NAV. System 1 first, then 2, then 3.

  - The inertial reference system is used by key systems like autopilot, flight control computers, flight instruments and navigation. A proper set-up is essential. NEVER move the aircraft while the three platforms are still aligning.



  - Note that ADIRS alignment, as on the real aircraft, will take around 10 minutes to complete. The time remaining to alignment is displayed on the engine / warning display (E/WD) (**4**) on the upper ECAM display.

- EXTERIOR LIGHTS

  - On the lower end of the overhead panel (EXT LT) move the ‘STROBE’ switch (**5**) to the ‘AUTO’ position.

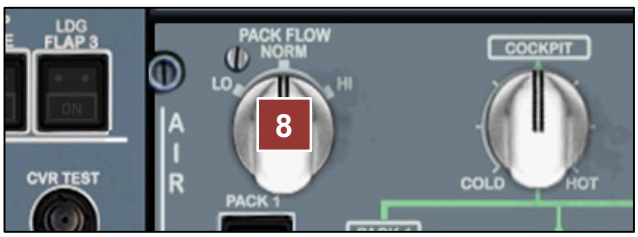
- SIGNS

  - Move your view to the right and set the ‘SEAT BELTS’ sign switch to ‘ON’ (**6**) since refuelling is completed.

  - To arm the emergency exit lights, move the switch ‘EMER EXIT LT’ to the ‘ARM’ position (**7**). Note that the amber ‘OFF’ light extinguishes.

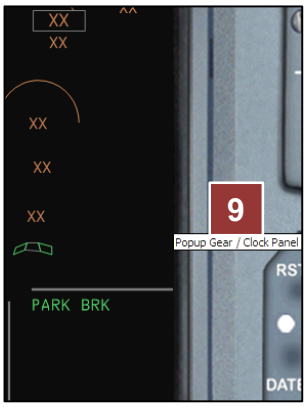
- AIR CONDITION
  Check that the ‘PACK FLOW’ selector is in the ‘NORM’ position (**8**). The low setting is only required if the passenger count is less than 115. The high setting is only needed in hot and humid conditions.

  - Close the overhead panel.



- NOSEWHEEL STEERING
  Click on the area right of the upper ECAM display to open the gear panel (**9**).

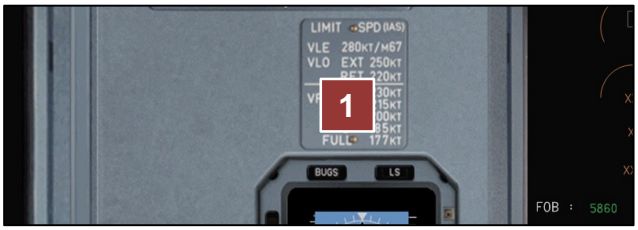
  - Check that the ‘A/SKID & N/W STRG’ switch is set to ‘ON’ (**10**).



CENTRE PEDESTAL

- TRANSPONDER / ATC
  Click on the speed limit placard located right above the standby instrument on the main panel (**1**). This will display the centre pedestal. Next, locate the transponder panel (labelled 'ATC') located to the left of the flaps lever.

  - Set the transponder to 'ON' (**2**), then set the altitude reporting (ALT RPTG) to 'ON' as well (**3**). Leave the TCAS selector (**4**) on 'STBY' for now.
  - Since there is no ATC for this tutorial flight, we won't need to set a new transponder code.



- COMMUNICATION PANELS

  - The communication panels are located next to the thrust levers, one on each side. Check that both of them are turned on. If they are not, turn them on using the ON/OFF switch (**5**).

    The panel can also be used to manually tune navigation frequencies if required.
  - When done close the centre pedestal using the X-symbol at the top left.

FMGS INITIALISATION

MCDU

The next step is to prepare the *Flight Management and Guidance System* (FMGS) for flight. To do this, we need to feed the *Flight Management and Guidance Computer* (FMGC) with relevant data. To do this, the crew uses the *Multifunction Control Display Unit* (MCDU) which serves as the interface between the pilots and the FMGC (and other systems too). Two of these units are located on the centre pedestal between the pilots:

Weights and Fuel

Before we enter data into the FMGC, we quickly confirm that the fuel and payload are set up correctly for this flight. Fuel and payload can be set using option menus accessed via the MCDU. This capability is provided as a convenience for purposes of the simulation and is not something that is available on the real aircraft. Payload weight consists of both passengers and cargo that is loaded into the belly of the aircraft. Fuel consists of the amount of fuel by weight (in kilograms for purposes of this tutorial) loaded via a refuelling panel located underneath the wing. Even though a fully simulated refuelling panel is available for the A320X simulation, its use is not part of this tutorial.

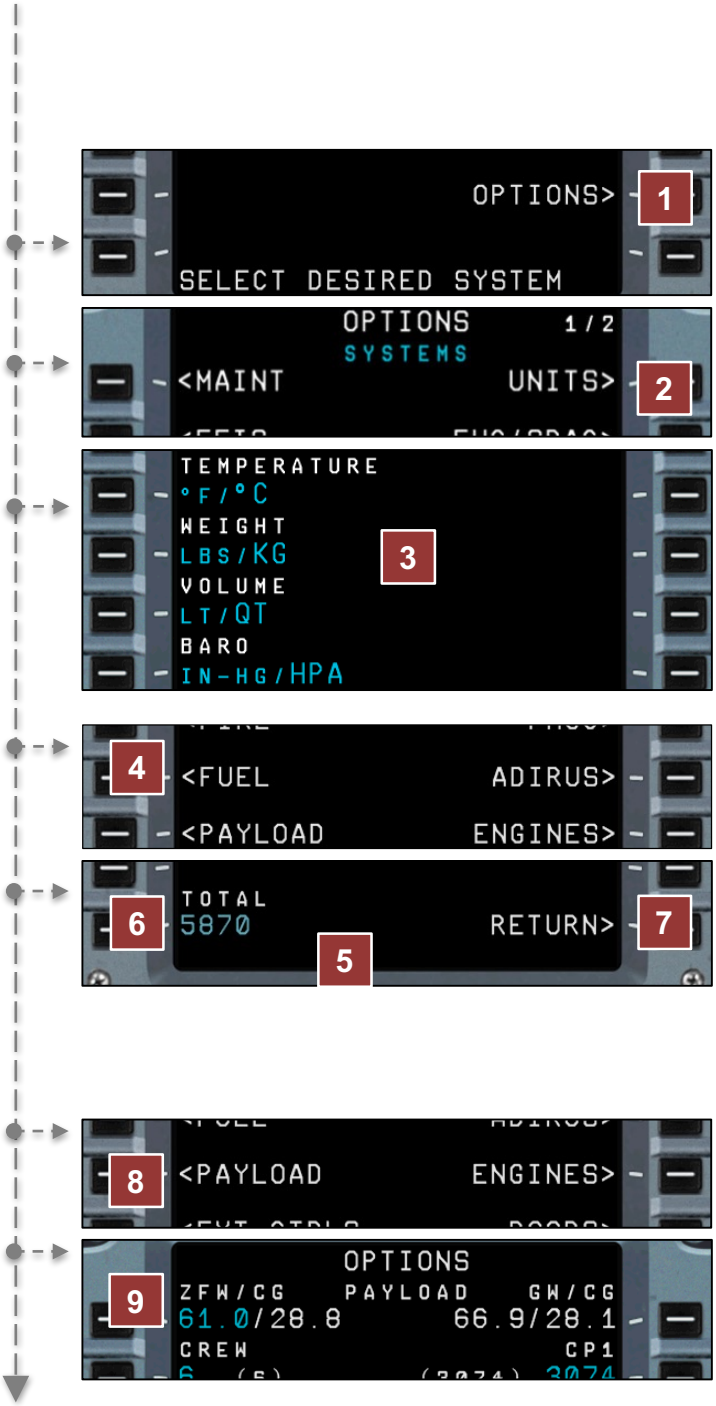
- WEIGHT UNITS

For this tutorial flight, we're going to fly using metric weights. Therefore, the A320 needs to be set accordingly via the MCDU option pages. Although the metric setting is standard after installation of the product, you must confirm the correct settings:

- Open the MCDU and access the options menu via the line select key 5 right (in short LSK 5R) (**1**).
- Then press the LSK next to 'UNITS' (**2**).
- Confirm that the units are set the same as the example to the right, with bigger letters for °C, KG, QT and HPA (**3**).
- Press the LSK 6R next to 'RETURN' to go back to the options page.

- FUEL / PAYLOAD

- To set the fuel quantity, press the LSK next to 'FUEL' (**4**).
- The total required fuel amount of this tutorial flight shall be 5870 kilograms. Type '5870' into the MCDU and note that this figure appears at the bottom of the MCDU display (an area known as the "Scratch Pad" (**5**)). Next, press the LSK 6L to change the fuel amount to the desired weight of 5870kg (**6**), followed by the LSK 6R (**7**) to return to the options menu.
- Proceed to the payload page by clicking on the LSK 5L (**8**).
- The total zero fuel weight (which is the total weight of the aircraft without fuel) shall be 61 metric tonnes. Type in '61' and then press the LSK 1L to change the zero fuel weight (ZFW) to 61t (**9**).



The ZFW and ZFW CG figures would normally be provided by the ground crew on the load sheet. For the purpose of this tutorial, we will consider the 61t figure as having been provided this way. Take note of the ZFW and ZFW CG numbers next to LSK 1L (**6**). You will need these numbers to properly programme the FMGC for the flight.

FMGC setup

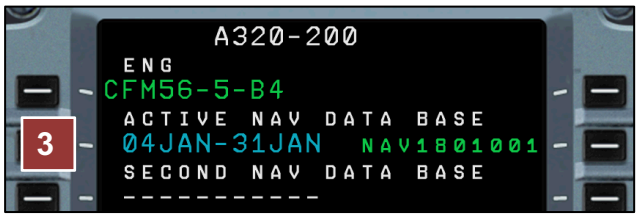
After payload and fuel have been set, it is time to prepare the FMGC for the upcoming flight.

- First press the 'MCDU MENU' button (**1**), then use the line select key 1 left (**2**) to access the flight management and guidance computer or FMGC.

  Should the ADIRS still be in alignment phase, an amber "GPS PRIMARY LOST" message will appear at the bottom of the display. When alignment is complete you'll see a simple "GPS PRIMARY" message. You may clear either by pressing the 'CLR' key on the lower right of the MCDU.

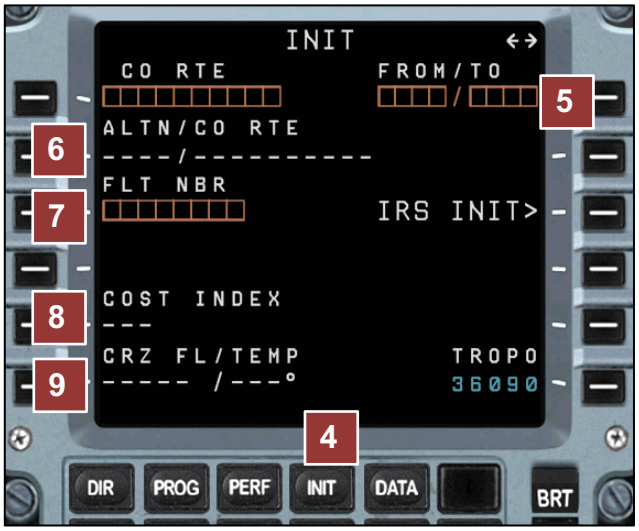
- At the top of the display you can see that we're sitting inside an A320 equipped with CFM56 engines.

  Next to LSK 2L (**3**) you see the date of the navigation database. If you haven't updated the database since buying the A320X then you will see the date 04JAN-31JAN. Otherwise the date of your currently installed database will be shown.



- FLIGHT PLAN INITIALISATION

- Press the 'INIT' key (**4**) on the MCDU to start loading flight plan data on the "INIT A" page of the FMGC.
  The following information will have to be provided:
  - (**5**) 'FROM/TO': Point of departure and destination.
  - (**6**) 'ALTN': The primary landing alternate airport
  - (**7**) 'FLT NBR': The flight number of today's flight.
  - (**8**) 'COST INDEX': A value specifying the relation between cost and speed for reaching the destination.
  - (**9**) 'CRZ FL': The intended cruise flight level for today's flight.



- First enter 'LOWW/EKCH' into the MCDU and then press the LSK 1R next to 'FROM/TO' (**5**).
- Then enter 'ESMS' for the alternate aerodrome at LSK 2L (**6**).
  Note: Manual alternate route entry would be required. However, this is outside the scope of this tutorial.
- Enter 'AUA303' at LSK 3L (**7**) as the flight number, followed by '20' for 'COST INDEX' one line below (**8**).
- The cruise level for this flight is flight level 360 or FL360. Enter '360' and press the LSK 6L (**9**).

The INIT page should now look like the example on the right.

Next to the flight level inserted you'll see a field for TEMP. This is the temperature forecasted for when you reach the cruise flight level. Since we use the standard P3D weather "Fair weather" you do not need to alter this number, the temperatures are set to ICAO standard atmosphere conditions (ISA).

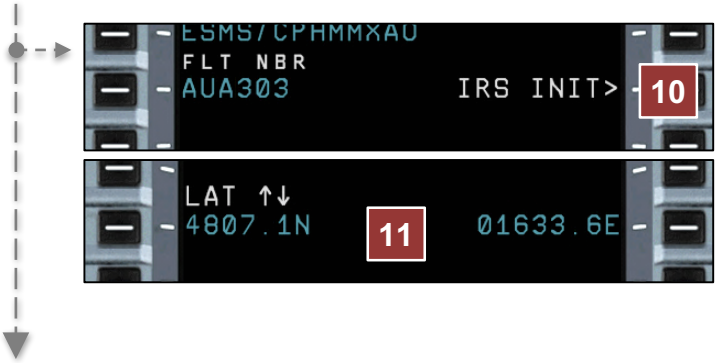
Note: Whenever you use real weather you must check the forecast of your flight planning software to get the actual value and correct the temperature accordingly.

Cost Index

The *Cost Index* (CI) basically defines the relationship between economics and duration of a flight.
A higher cost index results in a shorter flight time, achieved by higher speeds. This requires more fuel, resulting in higher operating costs.
The CI can differ depending on the airline and/or the route. Some airlines even use different CIs for climb, cruise and descent.

- ADIRS POSITION INIT CHECK

- When all data entry is done on the INIT page, press the LSK 3R to display the ADIRS alignment coordinates (**10**). Check the displayed coordinates (**11**) for accuracy comparing it with the actual gate position, which is 4807.1N 01633.6E. Correct if necessary by pressing the LSK next to the value for adjustment using the arrow keys.



Flight plan route insertion

Inserting the flightplan into the FMGC is an easy thing to do. It is achieved by inserting airways segments from the point where the SID ends, to the point where the STAR begins. 3 airway segments are needed for today's flight:

LANUX – L858 – **HDO** – M725 – **GERGA** – T239 – **PEROM** – T298 – **MONAK**
The 4-letter codes containing numbers are the airway designations.

- F-PLN A page

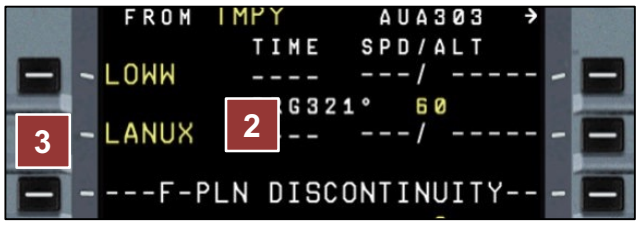
Press the 'F-PLN' key on the MCDU to access the flight plan. You can see the departure airport (LOWW) on the first line, followed by a flightplan discontinuity. A discontinuity (a gap in the FMGC's flightplan) is displayed because there is no route information present between the departure and destination airports.
To close this gap, start by inserting the first enroute fix, LANUX:

- Type 'LANUX' into the scratchpad, then press the LKS 2L next to the discontinuity to insert that fix into the gap (**1**).

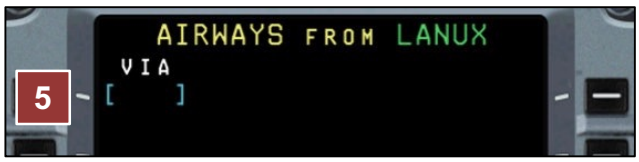
The waypoints then turn yellow, indicating that the flightplan is being edited and some of its data is not yet inserted into the ACUTAL flightplan.

- LANUX is now the starting point of the first airway segment (**2**). To enter airway information, we must access the "LAT REV" page of that fix.
- Press the LSK next to LANUX (**3**) to display its LAT REV page

  LAT REV stands for lateral revision, meaning a change of geographic data, such as waypoints.
- The LAT REV page then displays various possibilities for the chosen waypoint. We want to enter airway segments, hence the LSK 5R next to "AIRWAYS" is the next one to press (**4**).



- Enter 'L858' at the "VIA" field (**5**). This will specify the airway's designation for the first segment.



- Next, enter 'HDO' at the "TO" field (**6**). This specifies the end point of this first airway segment, as well as the starting point of the second one.

- Continue the last two steps using the rest of the route information:
  - via M725 (**7**) to GERGA (**8**)
  - via T239 (**9**) to PEROM (**10**)
  - via T298 (**11**) to MONAK (**12**)

  Until the AIRWAYS page looks **exactly** the same as the example to the right.

- Then press the LSK 6R (**13**) to insert all this temporary route information into the actual flightplan.
- Back on the F-PLN A page all the airway waypoints are visible in the active route. Note the airway designation being displayed between the waypoints.

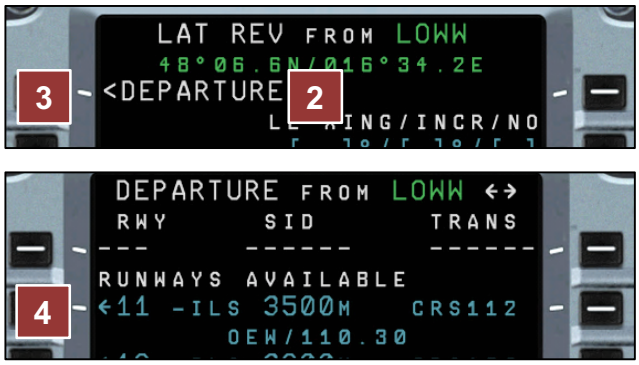
Runway and SID data insertion

- F-PLN A page (continued)

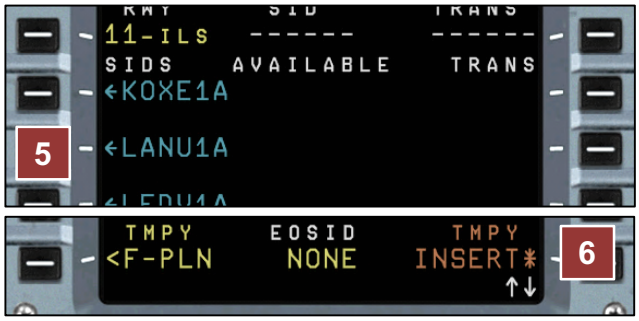
At the top of the flightplan page you can see the waypoint “LOWW” followed by “LANUX”, missing any departure procedure data. So now the FMGC still requires runway and SID information to be entered.

- Press the LSK 1L next to ‘LOWW’ (**1**) to access the lateral revision page for this waypoint.

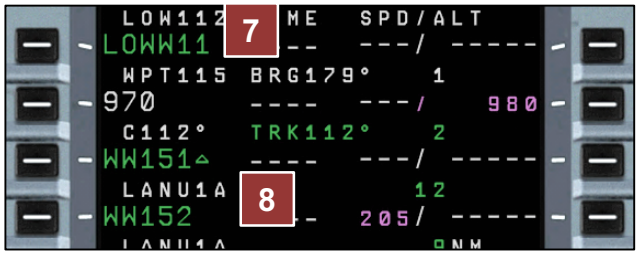
- Since this waypoint is in fact an airport identifier, we get the option of adding departure information (**2**). Press the LSK 1L (**3**) to get a list of runways to use. You must select a runway first in order to be able to select a SID.
- For this flight, we shall depart from runway 11, so press the LSK 2L to select it (**4**).



- Once the runway is selected, use the up-arrow key to scroll through the list of all SIDs for runway 11. You should find one called ‘LANU1A’, which is leading to our first route fix LANUX. Select this SID by clicking the LSK next to it (**5**), then press the LSK 6R next to ‘TMPY INSERT’ (**6**) to insert this data into the active flight plan.



- Looking at the flight plan on the ‘ACT F-PLN’ page you will notice that ‘LOWW’ has been replaced by ‘LOWW11’ (**7**) and all the fixes of the SID were added afterwards (**8**). These same waypoints are now shown on the navigation display (ND).



FMGC PERFORMANCE DATA INSERTION

The next step is to insert all the performance data necessary for the FMGC to compute the flight profile. This consists of some weight, speed and altitude data.

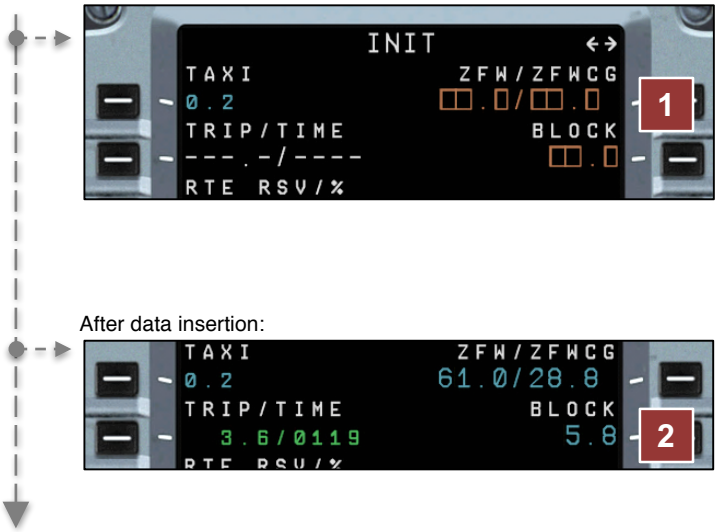
- WEIGHT INSERTION (INIT B PAGE)

First, press the INIT key on the MCDU, followed by the right or left arrow key to access the INIT B page. Note that it is labelled 'INIT', just like the first page where we entered FROM/TO, our ALTN, our flight number and our cost index. However, these are two distinct pages (INIT A and INIT B) that are accessed using the arrow key. We want to be on the B page.

- Enter the zero fuel weight (ZFW) together with the ZFW centre of gravity (ZFWCG).

  Use the numbers for ZFW and ZFWCG you've noted earlier from the MCDU payload option page. Enter '61/28.8', then press the LSK 1R (**1**) to put these values into the computer.

  Next enter the total amount of fuel – or block fuel – just one line below (**2**). You have noted this number earlier from the options fuel page. So enter '5.8' and press the LSK 2R to confirm the total amount of fuel.



ZFW CG

This is the Centre of Gravity entry for the airplane without fuel (Zero Fuel Weight - ZFW).
Caution: Never use this value to determine the take-off trim setting.

The ZFW CG value is normally coming from the load sheet provided by the load master.

It is very important to fill out the 'INIT B' page correctly. *The Flight Management and Guidance System* (FMGS) needs this data for a variety of calculations regarding the aircraft's performance.

Calculations such as climb- and descent profiles, cruising altitudes and speeds all depend on the information entered into the 'INIT B' page. If entered incorrectly, this may result in safety issues arising very quickly. For example, if you enter a weight for your aircraft that is lighter than it really is, the calculated take-off rotation speed will be lower than it should be. If you rotate at this incorrect speed the aircraft will not get airborne. Whenever this happens, a tail strike often results. The slat retraction speed may also be miscalculated, resulting in retracting the slats too soon. On a heavy aeroplane that is around its maximum take-off weight, this can be hazardous.

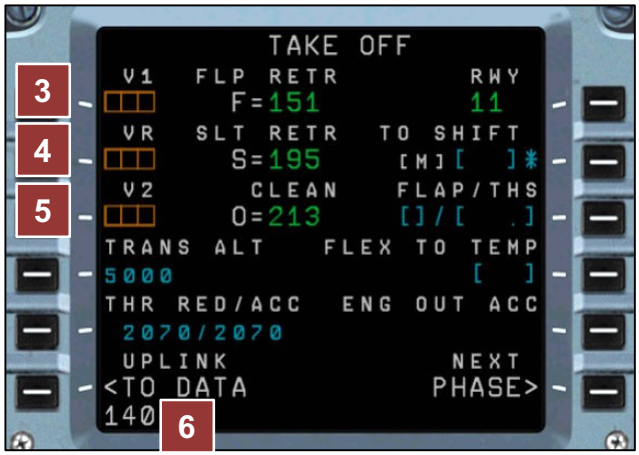
Finally, your climb profile, cruising altitude and speed may be off which in turn will result with your fuel planning being inaccurate.

Therefore, make sure that the weights you put in are indeed correct.

- TAKE-OFF DATA INSERTION

Press the ‘PERF’ key on the MCDU to get to the ‘TAKE OFF’ page. The numbers on this page will provide the FMC with information to calculate for the take-off phase.

- First enter the speeds for V1 (**3**), VR (**4**) and V2 (**5**). On the real aircraft these numbers are either looked up on paper tables or are calculated using a take-off performance software tool. For your convenience, you may press the LSK next to each field to get the correct number into the scratchpad (**6**). Then press the same LSK again to enter the number into the FMGC. For today’s flight V1 is 140kts, VR is as well 140kts and V2 is 141kts.



- For the flight to Copenhagen, we don’t want to depart using full take-off thrust as the aircraft is actually far from its maximum take-off weight. De-rated thrust is the keyword here. Entering a temperature into the take-off page that is higher than the ambient temperature will cause the thrust to be reduced. Enter ’59’ for ‘FLEX TO TEMP’ using LSK 4R (**7**).

  Enter ’1’ for flaps at LSK 3R (**8**), the take-off setting for the flaps.

After data insertion:

The FMGC set-up is now complete and ready for flight so you may close the MCDU using the ‘X’ symbol on the upper left corner. However, other major systems like electrics, hydraulics, fuel and air still need the pilot’s attention.

COCKPIT PREPARATION (CONTINUED)

Glareshield

- EFIS CONTROL PANEL

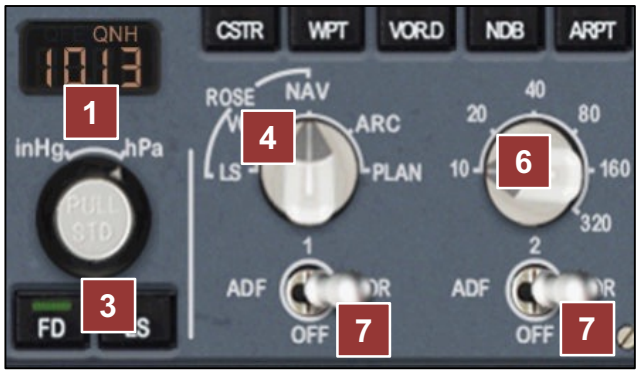
At this stage, the EFIS control panel as well as the flight control unit (FCU) need a few inputs for departure and navigation.

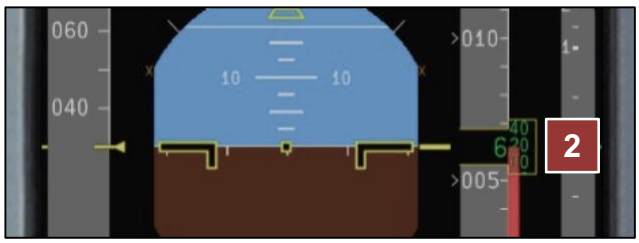
Barometric pressure needs to be set for the altimeter. You may obtain this value from ATC and/or the ATIS broadcast. Use the standard ATC key strokes to listen to Vienna Information on 121.725 MHz.

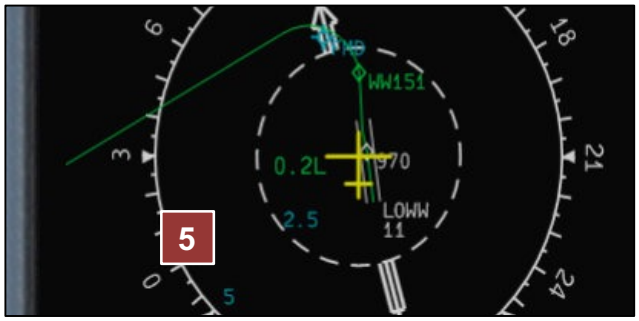
- Since we are flying using the P3D standard weather, the pressure is a standard 1013hPa, so you do not need to change the QNH (**1**). However, check that the altitude indicated on the PFD (**2**) is corresponding to the airfield altitude, which is approximately 600ft (depending on your exact location on the airport).

  Next, check that the flight director (FD) is on (**3**) and that the navigation display (ND) is set to ROSE NAV mode (**4**) (you will want to see the area behind the aircraft due to the sharp turn after departure (**5**)). The ND range should be set to 10nm (**6**).

  Set both ADF/VOR switches to the 'VOR' position (**7**) We will check the nav setting for departure later on.







- FCU

- Next, move right to the FCU and check that the speed indication is dashed (**8**), indicating managed mode. The HDG-V/S / TRK- FPA switch should be set to 'HDG V/S' (**9**) and the altitude must be set to our first cleared altitude, which is 5000ft according the SID description (**10**).

Transition Level / Transition Altitude

For this tutorial flight, we will not worry about transition level or transition altitude. As we are not flying under ATC supervision, these are not really needed.Since we are using default P3D weather, the altimeter setting is standard. Should you want to change transition altitude, you may do so on the 'PERF' pages in the FMGC in both the 'TAKE OFF' and 'APPR' phases.

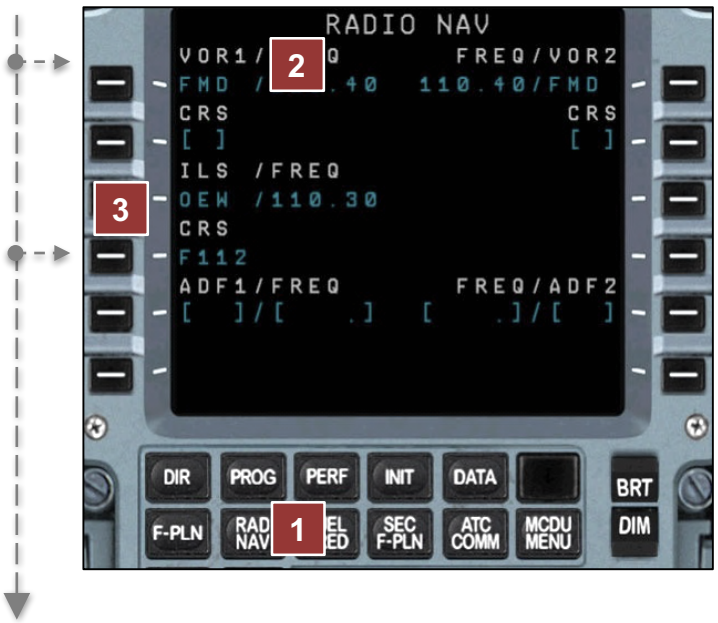
ATC

At this point, shortly before start-up, you'd normally receive ATC clearance. Since we are not using ATC, we can skip this. We know that we want to fly the LANUX1A SID and that the published initial climb altitude is 5000ft. Since there is no ATC, a transponder code is not necessary so we'll just leave the transponder set to 1200.

NAV Radios setup

Now is a good time to confirm that the NAV radios are set for the planned departure route. While the entire SID is pre-programmed in the FMGC for RNAV flying, a good radio navigation backup is still required. While we will not complete a full departure route briefing and navigation setup for this flight, here's a quick description on how to check the navigation aids setting:

- On the MCDU press the 'RAD NAV' key (**1**). On the first line, you will see that the Fishamend VOR (FMD) has already been auto-tuned by the FMGC (**2**). As this is the only relevant VOR on our departure route we can leave the settings as they are.
- Next to LSK 3L you can see that the ILS frequency for our departure runway is already set because the ILS equipped runway was selected for departure (**3**). This could be helpful in the event of an immediate return after take-off and should always be pre-selected if available.



This completes the cockpit preparation procedures necessary to set up the aircraft for our tutorial flight. However, we are not quite ready yet for start-up and pushback.

What does SID and STAR stand for?

SID: This stands for Standard Instrument Departure. The route given to you by ATC taking you from the runway to your route (most of the time by joining an airway with or without a transition)
STAR: Standard Terminal Arrival Route. This is the route flown away from an airway (or transition) to the initial approach fix where the approach procedure starts. Usually there is a holding pattern defined at the end of a STAR.

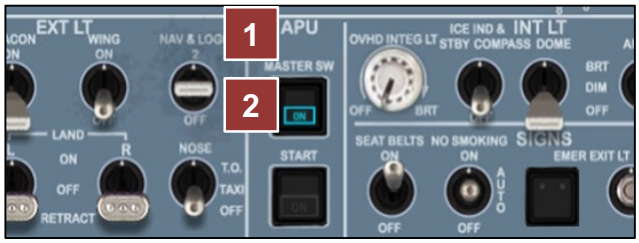
BEFORE START CLEARANCE

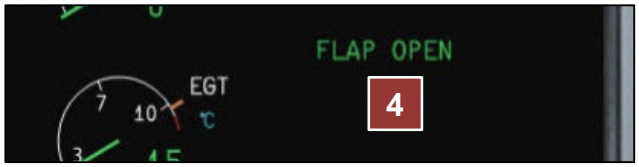
At this point (before gate departure), any tasks which require the cockpit crew to get out of their seats (such as the outside check) should be completed.
This is also a good time to start the APU as it needs some time to spool up. We will need it later on to supply power to the aircraft, bleed air for engine start and air conditioning.

- APU start

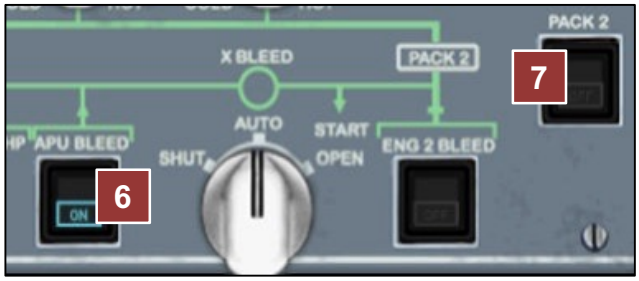
- Open the overhead panel again by clicking on the window centre post. Then look for the APU buttons at the bottom of the overhead panel (**1**). Press the 'MASTER SW' button (**2**). Then left-click at the bottom frame of the upper ECAM display (**3**) to access the lower ECAM display. This has now switched automatically to the 'APU' page. Look for the green 'FLAP OPEN' message (**4**), indicating that the APU air inlet is open and ready for the APU to be started.

  Move back to the APU controls on the overhead panel and press the 'START' button (**5**). Note that it takes a few seconds for the APU to begin with the spool up process. Once the APU start-up is completed the start button will display a green 'AVAIL' light, indicating the availability of both electrical power and bleed air.



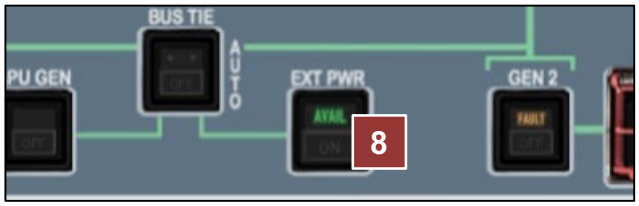


- To get the packs and air conditioning running, you need to connect the APU air to the air system. Press the 'APU BLEED' button located on the air conditioning panel (**6**). Observe the two amber 'FAULT' lights on the pack switches (**7**) extinguish a few seconds later after the packs start to run.
- Close both the overhead panel and the ECAM displays.



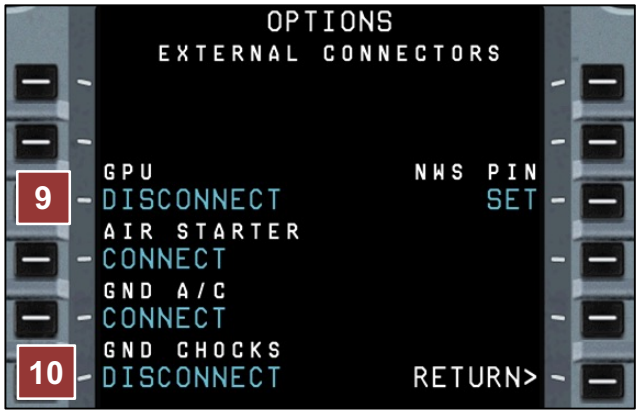
The following steps have to be taken before pushback and engine start:

- Next, press the 'EXT PWR' pushbutton on the overhead panel to disconnect the external power (**8**). You can clearly hear the relays switching.



- Since external power is no longer required, you may instruct the ground crew to disconnect the cable. To do this, open the MCDU, press the 'MCDU MENU' button, then the LSK 5R for 'OPTIONS', followed by the LSK 6L for 'EXT CTRLS'. All the external connections will be displayed. Press the LSK 3L (**9**) to disconnect the GPU.

  Also instruct the ground crew to remove the wheel chocks by pressing the LSK 6L (**10**).



- Note the 'AVAIL' light on the overhead electrical panel disappears (**11**).

- Press the 'PERF' button on the MCDU to display the 'TAKE OFF' page for departure. This will then automatically display the climb phase page later on.

Normally at this point, you would obtain start-up and pushback clearance from ATC. For this tutorial flight, it is assumed that you have received clearance to push back from the gate position and start the engines.

Before asking the ground personnel to start pushback, you need to confirm that the doors are indeed all closed. To do this, access the lower ECAM display again which will show the 'DOOR/OXY' page.
If the door symbols are all green, then the doors are closed. A white 'SLIDE' label next to each door indicates that the evacuation slide is armed. All slides will be armed automatically at engine start.

Note that the sliding cockpit windows are not monitored by ECAM. The two green boxes on the ECAM door page indicate the status of the maintenance access panels. This means you need to visually confirm that the cockpit windows are closed. The easiest way of doing this is by using the virtual cockpit (VC).

- For pushback and/or engine start the anti-collision beacons have to be on. Move the 'BEACON' switch (**11**) on the overhead lights panel to on.

You are now ready for pushback and start-up.

PUSHBACK & START-UP

Pushback

In order to maximize realism for the pushback procedure, the use of an add-on like AES or GSX is recommended. See the appendix of this tutorial for details.
If you are using such an add-on programme, you may start the pushback now and follow the steps to release and set the parking brake below.

- If you are using P3D for pushback, first rotate the parking brake lever on the centre pedestal to 'OFF' by left clicking on it with your mouse (**1**).

  Note: It is not possible to release the parking brake by pressing the brake pedals (or using the '.'-key). This is consistent with how the real aircraft works. You may however use the standard CTRL + . to release the parking brake.

Next, use the keystroke SHIFT-P to initiate pushback. You may then use the external view to judge the distance. Once on the taxiway press SHIFT-P a second time to stop the push. Note that it might take a couple of seconds before the aircraft comes to a complete stop.

- Set the parking brake again by rotating the lever to 'ON' with a right-click.

Start-Up

In most cases, you would commence engine start during pushback. For purposes of this tutorial flight, we will wait until pushback is completed so you can concentrate on the start-up procedure. Now that pushback has been completed, we are ready to start the engines.

- Engine ignition

  - The first step to start the engines is to activate engine ignition. By doing so, the aircraft's various systems know that you're about to start the engines. The packs will then turn off automatically.

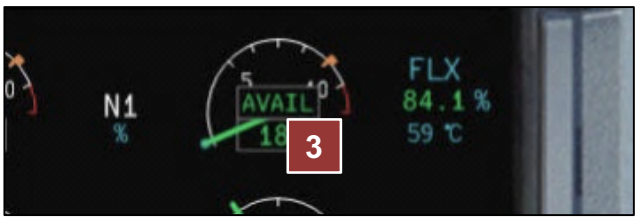
    Open the centre pedestal by left-clicking the speed limit placard. Then right-click the engine mode selector (**1**) to move the switch to the 'IGN/START' position.

  - You will then hear the packs turning off.

- Engine start

  - Start engine number 2 first by moving the master switch 2 to ON (**2**). To do this, right click the switch to lift it then left click to move it to the new position.

  - You may then want to close the centre pedestal and show both upper and lower ECAM displays. The upper ECAM display shows a green 'AVAIL' message inside the N1 scale to indicate a successful engine start (**3**).



At this point, you would check and confirm that all the engine parameters are within the normal range. However, for your first flight we will skip this and start engine number 1 right away.

- Move the master switch 1 to ON. Observe the engine spooling up and then look for the 'AVAIL' message again on the upper ECAM display.

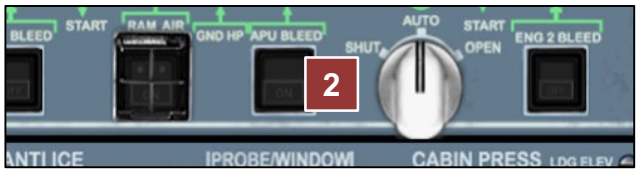
Engine start is now completed.

After engine start

The following few items need to be completed before we are ready for taxi.

- Engine mode selector
  - Back on the centre pedestal, rotate the engine mode selector back to the 'NORM' position with a left-click (**1**). This is important to prepare the aircraft's systems for departure.
- APU Bleed
  - Bleed air is now being fed from the engines so APU bleed is no longer needed. Open the overhead panel and turn off the APU bleed on the air condition panel (**2**).
  - Press the APU master switch (**3**) to start shutting down the APU. It will automatically start a brief cool down before spooling down. During this cool down the 'AVAIL' light on the APU start switch remains on for a short while.
- Centre pedestal
  - Open the centre pedestal and right-click the spoiler lever (**4**) to arm ground spoilers. You may also arm them by pressing SHIFT- / . Then left-click once on the flaps lever (**5**) or press the F6-key. This will set flaps to position 1+F for take-off.
  - Next the horizontal stabiliser trim needs to be set for departure. Use the CG value from the 'FUEL PRED' page of the FMGC (**6**). For today's flight, this is 28.1 (**7**). Rotate the hand trim wheel to **approximately** this setting (**8**). Left- and right-click the trim wheel to rotate it.

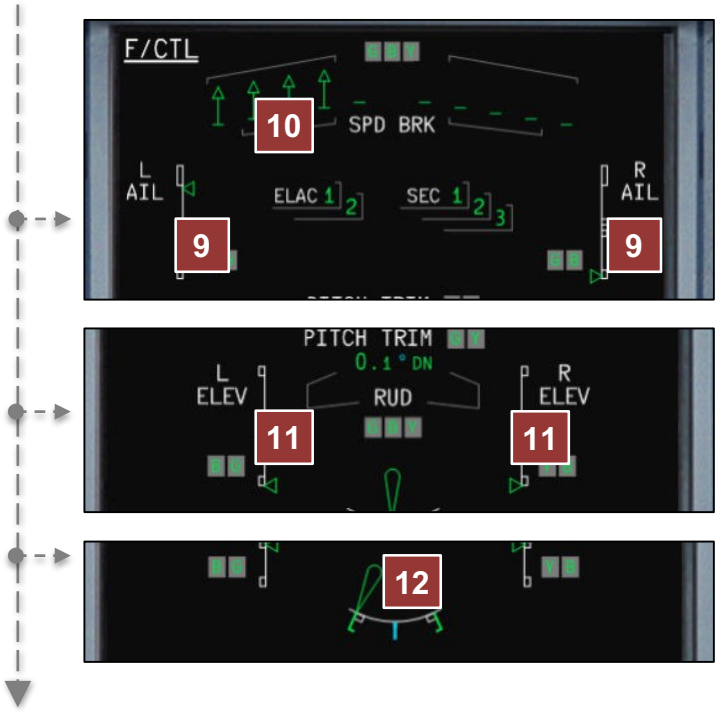
    Note: To read off the trim position, use the VC trim wheel indication or the P3D cockpit tooltips when using the 2D panel.



- Flight controls

Although this is another routine check that real world pilots perform, it is an important one. If flight controls do not work properly, then take-off will be very difficult. Once the aircraft's speed is past V1, you MUST leave the ground and the autopilot can't help you if the flight controls are not responding properly. Since PC hardware is not as precise as the real aircraft's stick and rudder pedals, let's perform this check just to make sure your flight starts smoothly.

- Bring up the lower ECAM display by left-clicking the bottom frame of the upper ECAM display. The flight controls page will display automatically as soon as you move the flight controls.
- Move the sidestick (your joystick) to full left and check for full travel of the ailerons (**9**) and the green spoiler arrows (**10**). Then move the stick to full right and check for the same.
- Move the sidestick to full forward and check for full travel of the elevators (**11**). Move to full aft and check for the same.
- Move the rudder to full left and full right and check for full travel in both directions (**12**).

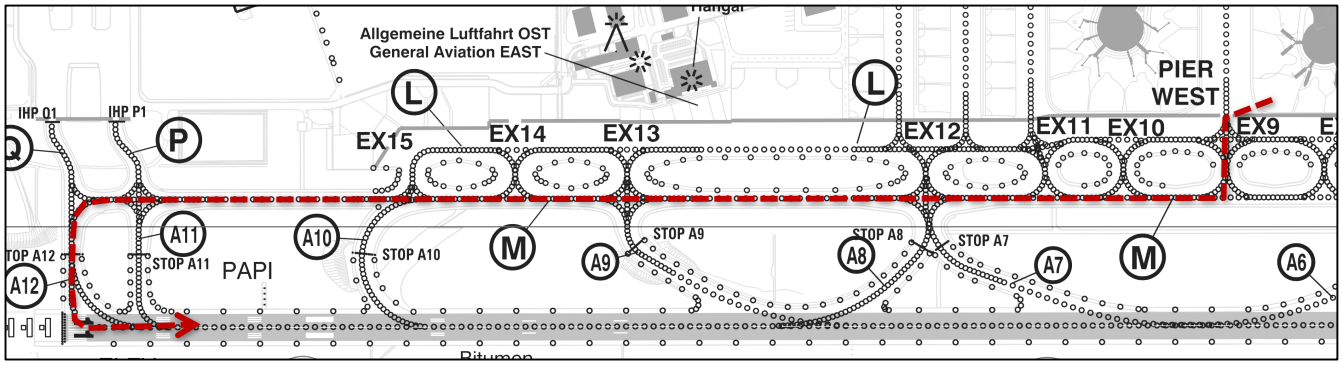


You are now ready for taxi.

TAXI TO THE RUNWAY

From the aircraft's present position, the departure runway 11 is not far away. During taxi a few additional items need to be taken care of before you are ready for departure.

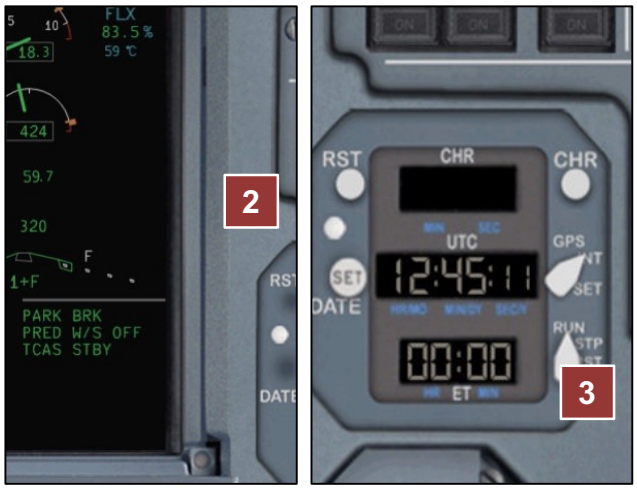
Taxi routing



The shortest taxi route to RWY11 is via: EX9 -> M -> A12

Note: P3D default scenery uses old taxiway designations which do not correspond to the actual ground chart shown above.

- Before you move the aircraft, left-click the window centre post to open the overhead panel.
- Right-click the 'NOSE' light switch (**1**) to set it to 'TAXI'. This will turn on the aircraft's taxi lights.
- Close the overhead panel and left-click the area to the right of the upper ECAM display (**2**) to show the clock. Left-click the elapsed time switch to move it to 'RUN' (**3**). This is necessary to record the block time.



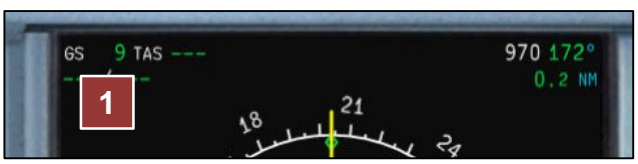
A few important items regarding taxiing
Do not taxi faster than 30kts.
90° turns: max. 10kts
Keep in mind that the aircraft needs a couple of seconds to react to thrust changes.

Taxiing

- Follow the taxi route above for runway 11.
  Release the parking brake by opening the centre pedestal and rotate the parking brake lever to 'OFF'.

- Advance the throttles slightly (max 40% N1) and observe the airplane's ground speed (**1**) increasing. Then move the throttles back to idle to avoid gaining too much speed.

  Adjust thrust to maintain no more than 15kts taxi speed and keep the aircraft on the centreline. Remember to slow down to a MAXIMUM of 10kts before making any 90° turns. Conduct a small brake test after you've started moving by applying the brakes slightly to observe the ground speed decreasing. You do not need to come to a full stop while doing this check.



- Predictive windshear system

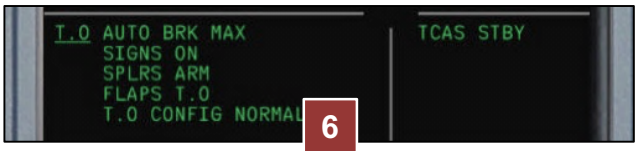
- Open the centre pedestal and locate the weather radar panel (**2**). While the radar itself is not required for the time being, however the predictive windshear system needs to be activated prior to take-off. Move the 'PWS' switch (**3**) to 'AUTO'.

- Autobrake

- Once again left-click the area to the right of the upper ECAM display to bring up the auto brake panel. Press the 'MAX' button and observe a blue 'ON' light (**4**). This will arm the autobrake system in the event of a take-off abort.

- ECAM displays

- Click the border below the upper ECAM display to access the lower display once again. Then press the 'TO CONFIG' button (**5**) to check for normal take-off configuration (**6**). Note that this cannot be done while the parking brake is set.



- Brake temperature

- Open the lower ECAM display to check the brake temperature (**7**). If the temperature is above 300°C, you'd have to delay take-off and wait until the temperature drops below that number. You can use the brake fan to help with cooling. Its switch is located right next to the landing gear lights above the autobrake panel.

You are now ready for departure. However, there are still a few items left to be done before you can advance the thrust levers to commence take-off.

Line-up

Since we are not using air traffic control for this tutorial flight, you may line up on the runway at your own discretion.

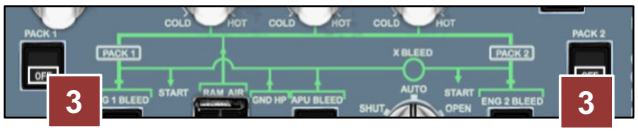
- Before entering the runway, open the overhead panel and switch on the strobe lights by right-clicking the 'STROBE' button (**1**).
- Move into position right onto the runway centreline and set the parking brake.

- TCAS

- Keep the centre pedestal open after setting the parking brake and switch on TCAS by switching its mode to 'TA/RA' using the switch on the lower right of the transponder panel (**2**). Right-click twice to set 'TA/RA'.

- Air conditioning packs

- Open the overhead panel and switch off both packs using their corresponding pushbuttons on the 'AIR COND' panel (**3**). While it is not mandatory to switch off packs for take-off, doing so increases performance and/or reduces maintenance costs under various conditions.



- Exterior lights

- Move down to the lighting panel to switch on the runway turnoff lights (**4**). These will help to reduce birdstrike hazard during take-off.

- Runway identification

- Confirm that you are indeed lined up on runway 11 as intended. To help determine the correct runway you may use the runway number markings if visible, press the 'LS' button on the glareshield EFIS panel to display the ILS localiser deviation or check the navigation display (ND) for the runway symbol being aligned as well.

If all is in order, you're finally ready for take-off.

TAKE-OFF

The following section on take-off not only tells you what to set and when, it also covers important things you must observe during take-off. Since all of these events will happen pretty fast, it is strongly advised that you read and understand this section thoroughly BEFORE attempting take-off.
Plan on engaging the autopilot after passing the minimum height of 100ft. In addition, climb thrust will be set 1500ft above ground. Acceleration and flap retraction will follow shortly after.

- Exterior lights
  - The following lights need to be turned on as soon as the take-off clearance is received (or in this case, when you decide to take-off):
    - On the overhead panel, move both landing light switches (**1**) to 'ON'.
    - Move the taxi light switch (**2**) to 'T.O.'.

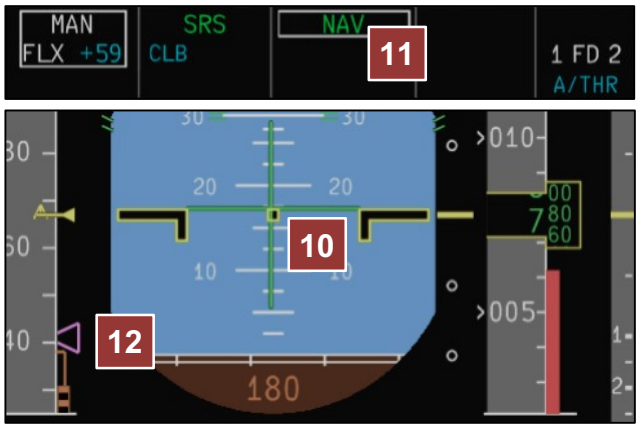
- Take-off
  - Release the parking brake.
  - Apply half forward sidestick deflection.
  - Advance the throttle levers to approx. 50% N1 (**3**) and observe both engines accelerate smoothly to that setting.
  - Then advance the throttle levers further to the second detent (FLX/MCT). You will hear a click noise for each detent. The FMA will then show 'MAN FLX +59' (**4**). At that point the take-off mode will engage This will also arm auto-thrust (**5**).

    Note: If you use the keyboard for thrust settings, you may press the F4 key two times to advance the levers to the second detent (FLX/MCT).
  - When thrust is set, press the 'CHRONO' button on the glareshield panel (**6**).
  - Don't forget to keep the aircraft on the centreline!
  - Start releasing the forward stick deflection at 80kts to reach neutral at 100kts.
  - Passing 100kts the V-speeds (**7**) will start to move down.
  - Once you pass the rotate speed of 140kts, start to pull the sidestick back firmly to achieve a rotation of approx. 3° a second towards 15° pitch attitude. After lift-off, follow the green pitch bar (**8**) to get it centred.
  - As soon as you see a climb rate indication and the altimeter is rising, left-click the landing gear lever (**9**) or press the G key to retract the landing gear.

- Take-off (continued)

- The flight director (FD) should be centred (**10**) and passing 30ft above ground, NAV-mode is engaged (**11**).
- Commanded speed by the FMGS is V2 + 10. Maintain this until passing acceleration altitude. Note that the magenta coloured triangle on the speed tape will show V2 (**12**), so this is different than the commanded speed!

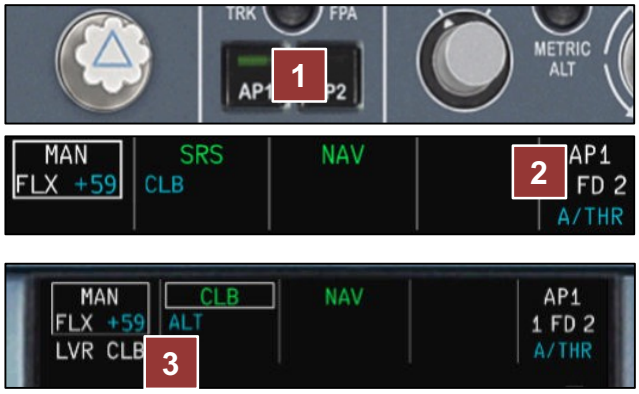
  Note: During the whole climb phase, speed is maintained by pitch only, so following the pitch bar of the flight director is essential to maintain the required speed.

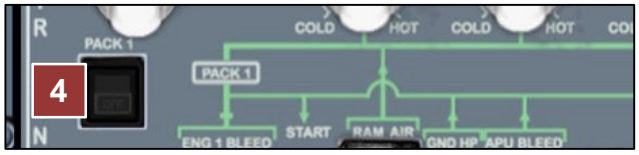


- Climbout

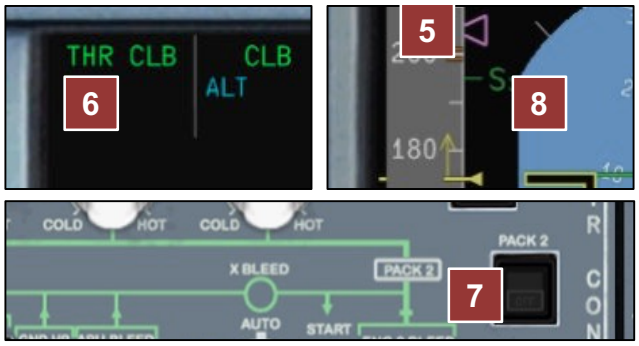
- As soon as you have the FD bars stable and centred, but not below 100ft AGL, you may activate the autopilot by pressing the AP1 button on the FCU (**1**). The FMA will show “AP1” to indicate that the autopilot number 1 has been engaged (**2**).
- When passing 1500ft AGL the FMA displays a white flashing “LVR CLB” reminder (**3**) to set the thrust levers into the climb detent. Reduce thrust until a click sound is audible, indicating that the thrust levers are in the CLB detent. You may also press the F1 key once to do this if you are using the keyboard.

  Monitor the aircraft’s nose being lowered accordingly.
- Open the overhead panel and turn on pack number 1 (**4**).





- Passing the acceleration altitude of 2070ft, the FMGS speed bug (**5**) moves up to start acceleration and the FMA displays THR CLB (**6**)
- Open the overhead panel again and turn on pack number 2 (**7**).
- Accelerating through the slat retraction speed (green -S marking on the speed tape - **8**) retract the flaps and slats by pressing the F6 key or right-clicking the flaps lever on the centre pedestal.



You will see the magenta speed bug being placed at 205kts. This is because there is a speed restriction on the SID being flown. As soon as you pass the waypoint “WW152” this restriction will be removed and the speed is increased to 250kts.

- Climbout (continued)

Soon after flaps retraction, you will reach 5000ft.

- Since there are no ATC restrictions for today's flight, you may now select the cruising flight level on the FCU by turning the altitude selector all the way to 36000 (**9**). Since you have received a clearance to flight level 360 and have entered it into the FCU, you then need to pull the altimeter setting selector on the EFIS panel (**10**) to set the QNH to standard setting. STD will then be displayed.

  Note: For today's flight, the QNH has already been set to 1013 for Vienna. However, you should still set it to standard anyway to stop the QNH setting on the PFD from flashing after passing the transition altitude.

- If the aircraft levels off at 5000ft, you will need to push the altitude selector on the FCU by left-clicking it at the centre. This will re-engage managed climb indicated by the solid circle next to the selected altitude (**11**). Then check for a green 'CLB' indication on the FMA.

- Once the aircraft is in a steady climb, open the centre pedestal and disarm the ground spoilers by left-clicking the spoiler lever (**12**). The white marking will disappear.

- Open the overhead panel and turn off both RWY TURN OFF lights as well as the NOSE light.

CLIMB

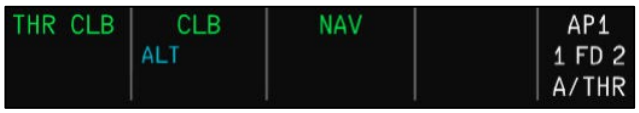
To confirm a normal climb, have a look at both the FCU and the FMA.

- FCU

  - Check that the only number being displayed is 36000 for the altitude. The other indications should display dashes and there should be three solid circles.

- FMA

  - THR CLB, CLB and NAV all need to be displayed in green. This indicates that the FMGS is in managed mode.



Passing FL100, the aircraft will lower the nose to accelerate towards a climb speed of 297kts.

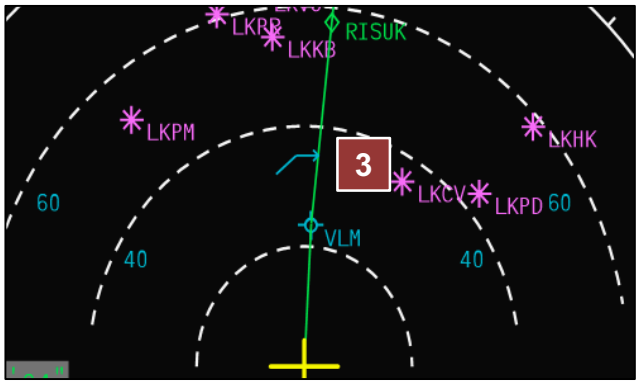
  - Also, above FL100, the landing lights are no longer required. Place both switches (**1**) to the “RETRACT” position.

Now that we are in a steady climb and there’s no significant weather ahead or above us, we can switch off the seat belt signs.

  - Move the ‘seat belts’ switch to OFF (**2**).

- Reaching cruise level

Approx. 23 minutes into the flight, you’ll reach your cruise altitude. The estimated point of level-off (the Top of Climb or TOC) is indicated by a blue arrow along the route (**3**).



CRUISE

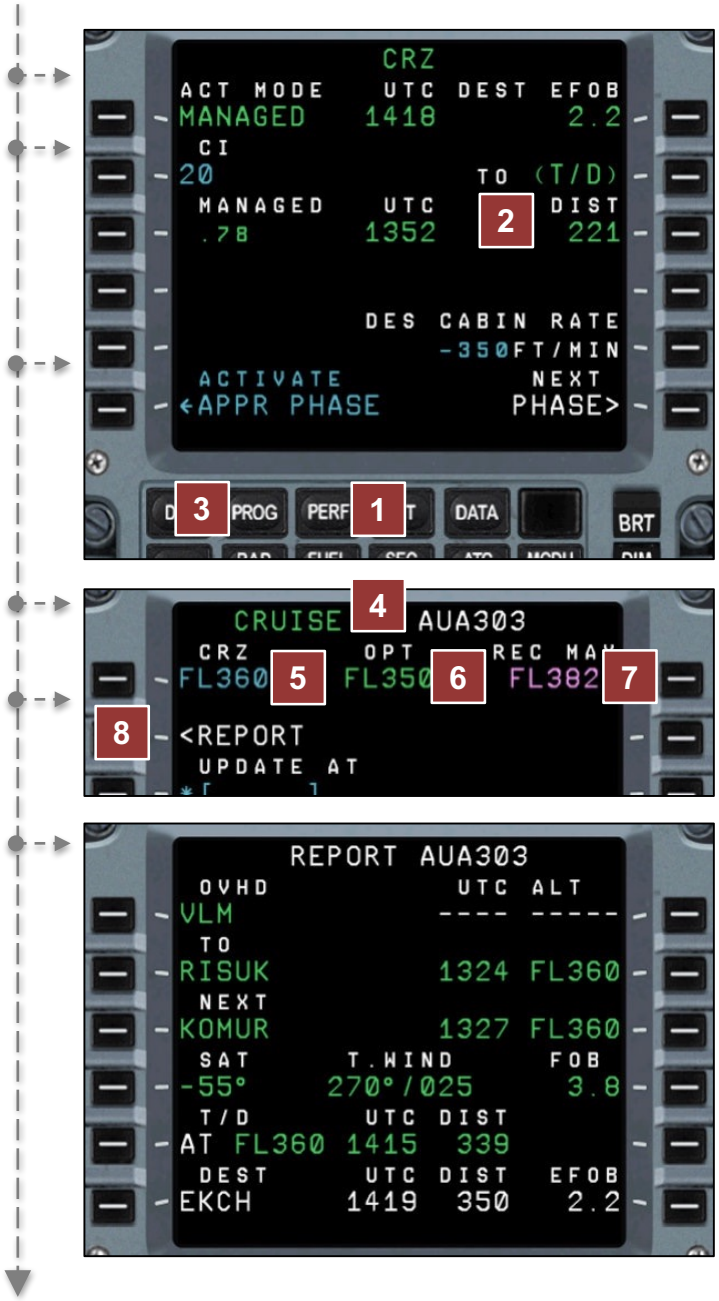
The aircraft will level off at the cruise altitude of FL360. There's not much to do at this point since the autopilot will automatically follow the inserted route. Now that we have some, we can look at some of the various information resources of the A320.

- FMS cruise information

  - Once you have reached cruise level, press the 'PERF' key on the MCDU (**1**).
  - The FMGC displays estimated time and distance to the descent point (**2**), marked as "T/D" (Top of Descent).
  - Press the PROG key (**3**).
  - At the top, the PROG page will show your actual flight phase, in this case 'CRUISE'. (**4**) Below, you can see your actual cruise level (**5**), the optimum cruise level (depending on weight) (**6**) and the maximum cruise level (**7**).
  - Press the LSK 2L to get to the report page (**8**).
  - On the report page, you can see the last waypoint, the next one and the one after that. You will also see the estimated time as well as what flight level that the waypoint will be crossed.

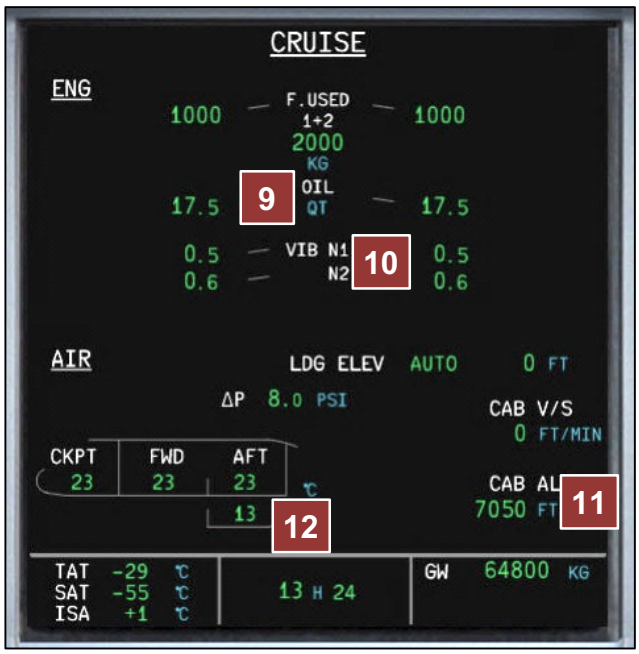
    The current temperature, wind and actual fuel on board are shown on line 4.

    Line 5 shows the estimates (time and distance) for the top of descent point. The bottom line 6 gives you an arrival estimate at Copenhagen airport, including time, distance and the fuel prediction at touchdown.



- Systems cruise information

- Access the lower ECAM display by left-clicking the frame below the upper ECAM. The lower ECAM will display the 'CRUISE' page, a neat status page summarizing a lot of data.
- Important data to monitor includes engine oil quantity (**9**), vibrations (**10**) and cabin altitude (**11**). If animals were being transported in the aft cargo hold, you would also need to observe that temperature from time to time (**12**).



- To monitor all systems in detail, use the 'ALL' key (**13**) on the ECAM control panel (ECP). Press the key repeatedly to cycle through all ECAM pages.
- To return to the CRUISE page, simply click the switch of any active ECAM page.

Entering approach data

Before beginning the descent towards Denmark, there's one major task that we need to perform. So far, our route ends at the fix 'MONAK'. We have not entered any runway, STAR or approach procedure into the FMGC. Therefore, the computer has no idea about the final stages of our arrival into Copenhagen.
Fortunately, entering the desired arrival, approach and ILS-procedure is a quick thing to do.

- Adding STAR and approach data to the flight plan

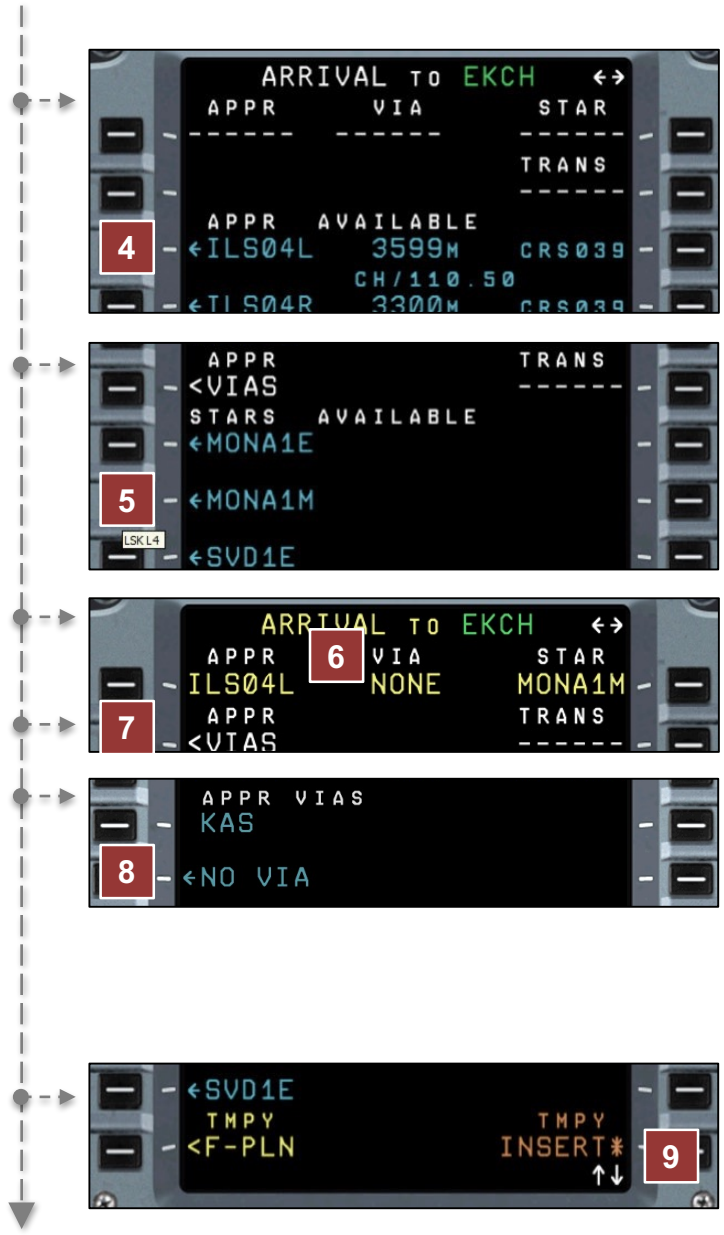
- On the MCDU press the 'F-PLN' key (**1**) to display the flight plan.
- Press the LSK 6L next to EKCH (**2**) to proceed to the 'LAT REV' page.

- On the 'LAT REV' page press LSK 1R (**3**) to go to the arrival route and approach selection page.

- Adding STAR and approach data to the flight plan (continued)

- On the ARRIVAL page select in the left column 'ILS04L' by pressing the LSK 3L (**4**). This will enter the ILS approach for runway 04L at the top line in yellow because it is only temporarily selected so far. In other words, we have yet to insert this procedure into the flight plan. We'll do so in a moment.
- Next press the up-arrow key to scroll through the available STARs and select 'MONA1M' with the appropriate LSK (**5**). Note that you will not be able to select a STAR unless you have first chosen an arrival runway.
- Then make sure that next to 'VIA' it reads 'NONE' (**6**). If it does, skip steps 7 and 8.
- **If** instead 'KAS' is displayed below VIA, press the LSK 2L next to 'VIAS' (**7**), then select 'NO VIA' (**8**). This will remove the turn via the KAS VOR.
- Then double check the top line (**6**) to ensure both ILS 04L and the MONAK 1M arrival are correctly selected:

  ILS04L – NONE – MONA1M
- Press the LSK 6R next to 'TMPY INSERT' to add the selected arrival information to the active flight plan (**9**).



Back on the flight plan page, you may scroll down using the up-arrow to have a look at the STAR and approach that have now been inserted into the active flight plan.
You will notice that the destination waypoint was amended with the selected runway and now displays 'EKCH04L'. The blue coloured waypoints at the bottom of the flight plan are those used for the standard missed approach procedure for the ILS 04L approach and would become active should you enter the go-around phase.

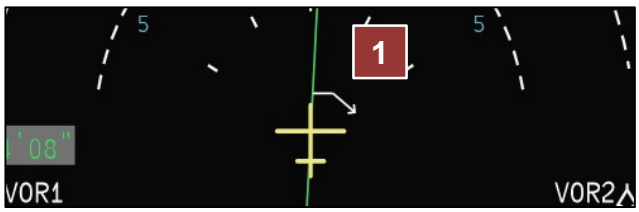
DESCENT

After a short cruise phase, you will be seeing the top of descent point appearing on your ND marked with a white downward pointing arrow. It is now time to enter the descent phase.

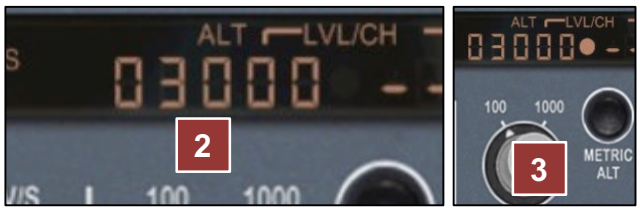
Starting the descent

About 55 minutes into the flight you will be approaching the top of descent point visible on the ND (**1**).

- Open the overhead panel and turn on the seat belt sign.

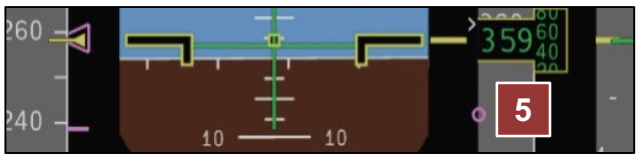


- On the FCU, change the altitude to 3000ft (**2**). This is the altitude at which we will be capturing the glideslope for Runway 04L.
- The aircraft will NOT start to descend automatically when you reach the top of descent mark. You must manually begin the descent by pushing (left-click) the altitude selector on the FCU (**3**). Note that the solid circle next to the altitude reappears, indicating that the aircraft is following a managed descent.



- The FMA will advise when it is time to initiate the descent by displaying a white 'DECELERATE' message (**4**).

- The PFD will display a path deviation indication (**5**).



- The FMGC PROG page will show the deviation in numbers next to the LSK 2R, labelled 'VDEV' or vertical deviation (**6**).

Flying the STAR

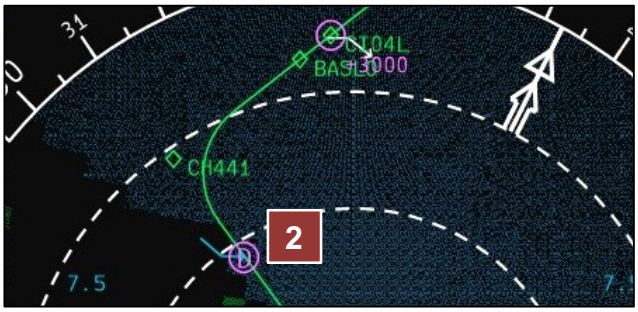
The “MONA1M” STAR has one altitude restriction (**1**). Should you reach this altitude restriction before overflying the corresponding waypoint, the aircraft will level off and continue the descent automatically after passing the waypoint.

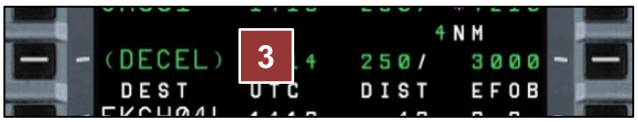
- Upon reaching FL100, turn on the landing lights.

On the ND, you will see a circled letter D near the waypoint CH441 (**2**). This is also visible in the FMGC F-PLN page as ‘(DECEL)’ in brackets (**3**), indicating it is a performance based fix as opposed to a geographical one.
This deceleration point marks the automatic activation of the FMGS approach phase. If you are in managed speed mode (which, as indicated by the solid circle next to the speed display on the FCU, you are), overflying the deceleration point will trigger the FMGC to start speed reduction.

- FMGC approach page
This page displays important information that the aircraft will need for the approach.

- Press the ‘PERF’-key (**4**) on the MCDU when passing the waypoint MONAK, followed by the LSK 6R (**5**) to get to the approach page. It is necessary to choose “NEXT PHASE’ because the FMGC is still in the descent phase at this point.





- Default landing flaps is flaps full, indicated at line 5 (**6**).
- Final approach speed is displayed at line 5 as well (**7**). Speed will however be maintained by the FMGS until touchdown.

- Required data entry

As you can see, there is still some information missing on this page which needs to be inserted at this point.

- If you wish, you can listen to the ATIS information on the frequency 122.750 MHz. Use the standard P3D ATC controls if in range of the airport or tune the frequency manually on the centre pedestal.
- Enter the airport QNH at LSK 1L (**8**). Today, this is standard pressure 1013 hPa. Enter the current temperature of 15°C (**7**) at LSK 2L. The current winds are calm so enter '0/0' at LSK 3L (**9**).
- Finally, enter the decision height for the Cat2 ILS approach runway 04L, which is 106ft. Enter '106' at LSK 3R (**10**).

- Approach preparation

- Next set the barometric pressure on the EFIS panel to 1013. Left-click the knob (**11**) to deactivate standard pressure setting.
- Then press the 'LS' button right below the QNH knob (**12**) to display the ILS information on the PFD.

  Note in the lower left corner of the PFD that the correct ILS frequency has been tuned automatically (**13**).
- When passing the waypoint CH551, activate the FMGC approach phase.

  To do this, press the 'PERF' key on the MCDU (**14**), followed by the LSK 6L next to 'ACTIVATE APPR PHASE' (**15**). **Press the same LSK again** to confirm the action.

The aircraft will now start to decelerate towards minimum clean speed.

APPROACH AND LANDING

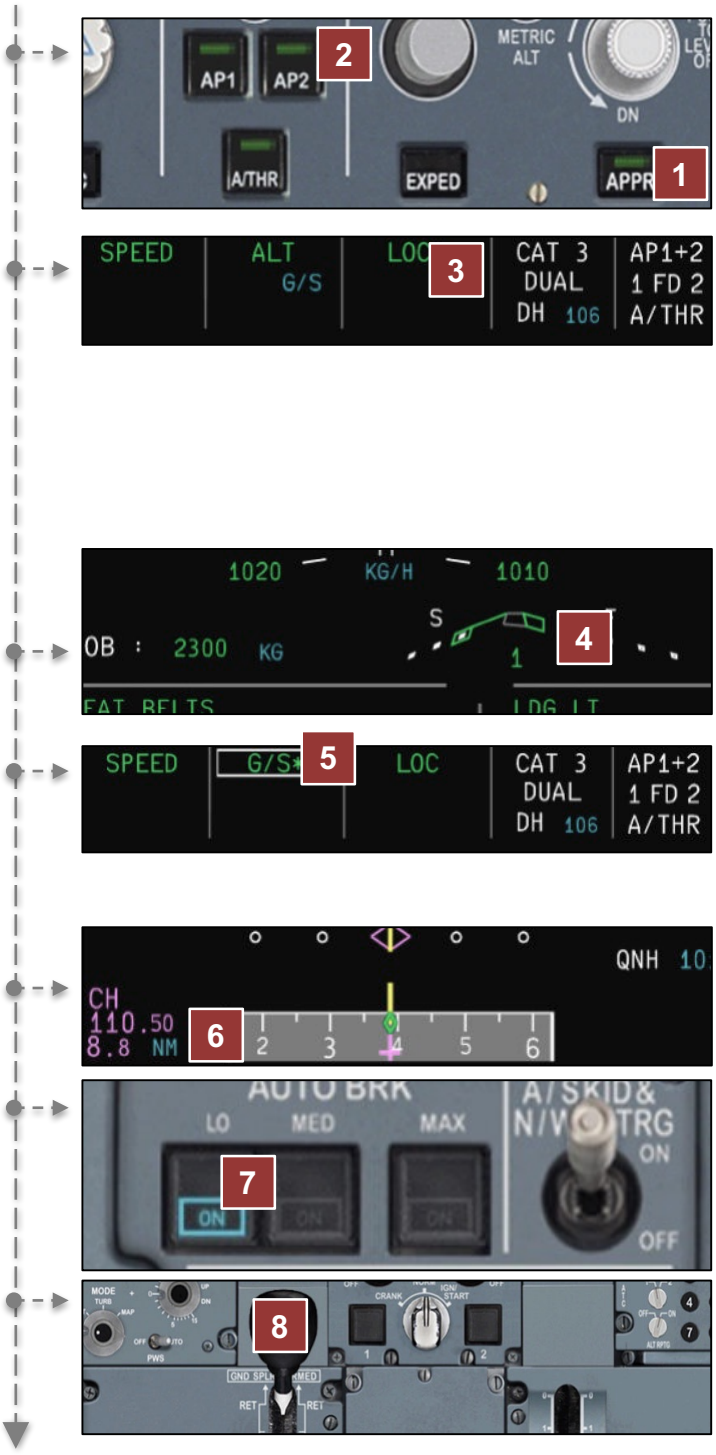
ILS approach using autoland

Having activated the approach phase and short before passing 'CH441', you are entering the approach phase for the ILS runway 04L. We'll be doing a standard autoland to make use of all of the A320's automation.

Note that the FMGC managed speed is now being reduced to 207kts, your current minimum clean speed, even though the speed bug is already set to 138kts. As long as you don't select any flap setting the speed will remain at 207kts.

- Arm the approach and land mode by pressing 'APPR' on the FCU (**1**).

  Next, click the AP2 button on the FCU (**2**) to activate the second autopilot. This is required to perform the autoland.
- Localiser capture will be indicated on the FMA first as 'LOC*' and then 'LOC' in green (**3**).The aircraft will no longer follow the flight plan route but instead the localiser beam being received from the ILS for runway 04L.
- Overflying the CH441 waypoint, check that the speed is below 230kts and extend slats (Flaps 1) by opening the centre pedestal and left-clicking the flaps lever once. You may also press the F7-key once.
- Check the flaps indication on the upper ECAM display (**4**)
- Passing the CH93 waypoint, the glideslope will be captured. Glide slope capture is indicated by a green 'G/S' on the FMA (**5**).
- Immediately lower the flaps to position 2 by left-clicking the flaps lever once again.
- Lower the landing gear.
- The DME distance from touchdown is displayed on the lower left corner of the PFD (**6**).
- When passing DME 7, lower the flaps to position 3. Open the gear panel to set the autobrake to the low or 'LO' setting (**7**). Open the overhead panel and turn on the nose wheel light.
- Next, open the centre pedestal to arm the ground spoilers by pulling the lever with a right-click (**8**).



- When passing 5 miles DME, lower the flaps to the 'FULL' setting and confirm by checking the flaps indication on the upper ECAM display (**9**).
- Continue to observe the PFD for any mode changes. Passing 400ft above ground, the autopilot automatically switches into 'LAND' mode.
- 50ft above ground the 'FLARE' mode will activate.
- On touchdown, the 'ROLLOUT' mode will activate This mode will keep the aircraft on the runway centreline.

Landing and rollout

- When over the threshold get ready to pull the thrust levers to idle once the "retard" callout sounds. Use your hardware throttle lever or press the F1 key once.

  The auto thrust system will be deactivated by selecting idle thrust (**1**).

- Immediately after touchdown, pull the levers into idle reverse. If your thrust levers don't have a reverse range, just press the F1 key once more.
- Check the reverse thrust activating on the upper ECAM. First, you will see amber 'REV' indications (**2**) while the reverse mechanism unlocks. Then these switch to green colour.

  Pressing F1 one more time would activate full reverse. However, this is not required on a dry runway this long.

- Continue the roll out.
- Whenever you feel the need to override the autobrake, you may do so by applying brakes manually. This will deactivate the autobrake system.
- When reaching the desired runway vacation speed disengage the autopilot using your joystick button or the Z key on your keyboard. Use nose wheel steering to take the next convenient high speed exit to the left.
- Once taxi speed is reached, deactivate idle reverse by moving your hardware throttle lever into idle or by pressing the F4 key once.

AFTER LANDING

After the runway is vacated and while you taxi to the terminal, there is an after landing flow to complete. If you don't want to do this while you are moving, you may stop the aircraft once you have left the runway.

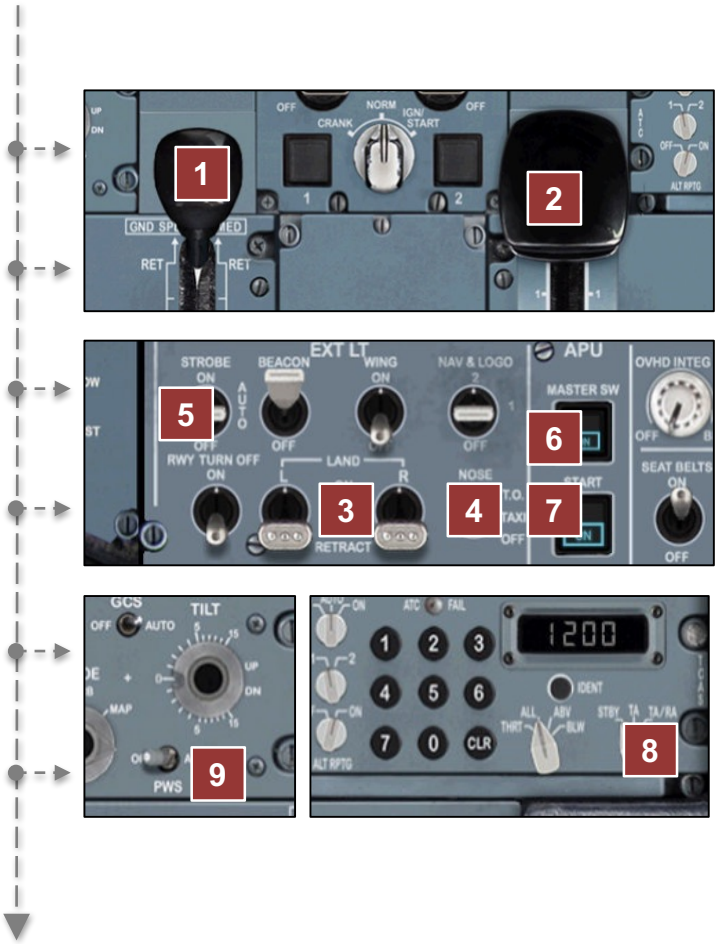
Taxi routing

Upon vacating runway 04L, you will see all the terminal buildings in front of you. If you continue straight down taxiway A you will end up at Pier B. The closest suitable gate is B17.

After landing flow

- Stop and reset the chronometer by pressing the 'CHRONO' button twice, whenever time permits.
- Retract and disarm ground spoilers by pushing the spoiler lever down with a left-click (**1**).
- Retract flaps by right-clicking the flaps lever four times (**2**).You may also use the F5 key which will retract the flaps one step for each press.
- Turn off the landing lights (**3**), switch the nose wheel light to 'TAXI' (**4**) and switch the strobe lights to 'AUTO' (**5**).
- Turn on the APU by pressing the 'APU MASTER' switch on the overhead panel (**6**), followed by the 'START' button below (**7**).
- Switch off the predictive windshear system using the 'PWS' switch on the weather radar panel (**8**).
- Set TCAS to standby by rotating the mode switch to 'STBY' (**9**).

  Caution: Do not turn off the transponder. It is required for ground radar tracking by ATC.



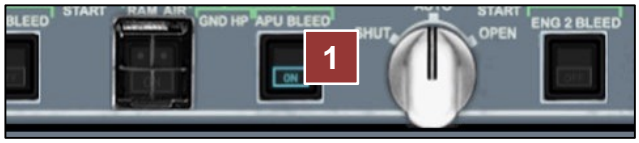
If you are not already doing so, continue taxiing to the gate. Remember to turn the nose wheel light to OFF when turning into the gate (the waiting ground crew will thank you for that!) When reaching the final parking position, set the parking brake by right-clicking on the parking brake lever on the centre pedestal or by pressing CTRL + . on your keyboard.

When the parking brake is set, continue with the 'Parking' flow on the next page.

PARKING

When parking an airliner at the gate, you do not shut it down completely. There will be various people working on the plane long after you have left and they will need the aircraft to be powered. The following flow keeps that in mind.

- Turn on the parking brake if not already set.
- Turn on APU bleed using the 'APU BLEED' button on the overhead 'AIR COND' panel (**1**).
- Turn off both engine master switches (**2**) to shut down the engines.
- Turn off the 'BEACON' lights on the overhead lighting panel (**3**). This allows the ground crew to approach the aircraft.
- Then turn off the seat belt signs (**4**).

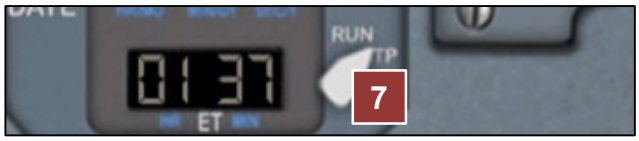


- Check for the chocks being put in place by communicating with the ground crew.

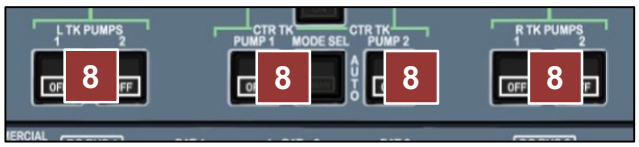
  This is done by using the 'EXT CTRLS' menu on the MCDU options page.

  Select both 'GND CHOCKS' (**5**) and 'GPU' (**6**). 'CONNECT' will change to 'DISCONNECT' for each. We need ground power so that the APU can be shutdown later on.

- Open the clock panel and stop the elapsed time (**7**).



- Turn off all fuel pumps on the overhead fuel panel (**8**).

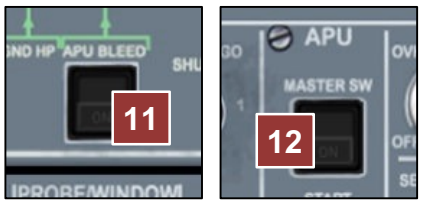


- Set the transponder to standby by rotating the ATC mode switch to 'STBY' (**9**).

- Switch on external power by pressing the 'EXT PWR' button on the overhead ELEC panel (**10**).

- Turn off APU Bleed and the APU itself (**11**)(**12**).

  Note: Do not turn off the APU unless the GPU is connected and you have selected EXT PWR.



Turning off the APU Bleed and the APU will result in the loss of air conditioning in the cabin and on the flight deck. However, with low outside temperatures, passengers leaving the aircraft and doors opened, there is little need for air conditioning. If you want the air conditioning systems to keep running at the gate, you can connect 'GND A/C' via the 'EXT CTRLS' menu on the MCDU options page. This provides air from an external source.

If a return flight is to follow shortly afterwards, the three ADIRS do not need to be turned off. In this case the aircraft is going to fly back to Vienna.

DEBRIEFING

You have now completed a flight utilising real procedures with the maximum automation available. All parameters like speed, altitude and routing were controlled by the FMS.

If you want to fly this tutorial again, you may want to experiment with the other available autopilot modes like V/S selection, FPA (flight path angle) or an open descent (descent with idle thrust). Should you wish to add real weather, keep in mind that with real winds descent planning might be unpredictable. You may even be forced to use a different departure and/or arrival runway due to wind.

Ultimately, when using real weather and ATC, you will discover that it is not always possible to use the full automation capabilities of the FMS as we did in this tutorial flight.

Another important skill that you need to learn is how to manually fly the A320. Once you get familiar with the take-off procedure, you can try to keep the autopilot disengaged after departure until the first level-off. When landing the aircraft, you can try disengaging the autopilot once you are established on the ILS and hand fly the approach instead of using autoland. After all, autoland is avoided as much as possible in real flight operations so pilots can get as much manual flight experience as possible. An autoland is usually only performed if weather or a CATIII rating requires it.

You will also want to experiment with the extensive failures menu to simulate or train for non-normal operations. Familiarity with the various systems of the aircraft and knowing what to do in the event of a failure in one or more of those systems will be essential to successfully complete the flight

If you have not already done so you should now read the A320-X Introduction Manual document which came with the PDF documentation. This will help you to use this aircraft as it is intended.